

Final Technical Report:

Award Number: USGS-98HQGR1011

Title: The Delineation of Current Active Strands of the San Jacinto Fault Zone Southeast of Anza, California, Using Fault-Zone Trapped Waves

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Technical Abstract

We installed three 350-m-long seismic arrays in 1999, each array consisting of 12 three-component stations, across the Coyote Creek fault, Clark Valley fault, and Buck Ridge fault of the San Jacinto fault zone in Santa Rosa Mountains southeast of Anza, California, to record micro earthquakes. We observed 4-7 Hz fault-zone trapped waves at stations located close to the fault trace for events occurring within the fault zone. Observations and finite-difference simulations of trapped waves revealed the low-velocity and low- Q zone (wave guide) on these active faults, within which the shear velocity is reduced by 20 to 30 percent from wall-rock velocities and Q is 40-90 in the depth range from the surface to ~18 km. The low-velocity wave-guides on these fault strands are 75 to 100 m wide. Locations of micro earthquakes for which we observed trapped waves show that the wave-guide on the BRF dips southwestward and the wave guide on the northern CVF dips northeastward. Two wave guides merge at depth below 12 km and extend further northwestward through Anza slip gap connecting another wave guide on the Casa Loma fault, which has been delineated in our previous study using trapped waves [Li *et al.*, 1997]. On the other hand, the wave-guide on the CCF in Coyote Mountain is nearly vertical and disconnects from the SJF at the south edge of Anza gap. We interpreted the low-velocity wave guides on these active faults as being a result of ruptures in major historical earthquakes occurring on them. However, trapped wave inferred wave guides on

the SJFZ near Anza show the narrower width and faster seismic velocities than the wave guide on the fault zone ruptured in the 1992 $M7.4$ Landers, California, earthquake [Li *et al.*, 1994]. It is because the SJFZ near Anza has not ruptured yet in $M>7$ earthquake at least in the past century.

Non-Technical Abstract:

We installed three 350-m-long seismic arrays across the Coyote Creek fault, Clark Valley fault, and Buck Ridge fault of the San Jacinto fault zone southeast of Anza, California; to record fault-zone trapped waves generated by micro earthquakes in 1999. Observations and simulations of these trapped waves allowed us to delineate the fine structure of this active fault at seismogenic depth. The low-velocity and low-Q zone within which seismic velocities are reduced by 20 to 30% from wall-rock velocities and Q is 40-90 marks faults. The zone is 75 to 100 m wide and extends from the surface to ~20 km depth. Locations of micro earthquakes for which we observed trapped waves show that the BRF dips southwestward while the CVF dips northeastward, and the two faults connect at the depth, but the CCF disconnects from them near Anza slip gap. The low-velocity zones inferred by trapped waves on these active fault strands of the SJFZ consistent with rupture zones of major historical earthquakes occurring on them.

